Early Flowering, Short Internode Length and double podding as Components of Early Maturity in Chickpea

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Introduction

Late maturity, resulting from the indeterminate nature of the crop, is a critical production constraint in chickpea (Kumar and Abbo, 2001). In western Canada, the chickpea crop is often killed by fall frost while seeds/pods are yet filling, which reduces both the quantity and quality of economic yield (grain). It was hypothesized that incorporating early flowering, short internode length and double podding traits may shorten the overall duration of growth in chickpea. Early flowering would advance onset of reproduction, while the latter two traits hasten the rate of pod formation and then progress towards maturity. Hence, a study was initiated to determine the effect of these key traits on time (days) to maturity in chickpea.

Materials and methods

A preliminary study on genotypic differences for time to flowering was conducted in growth chambers during fall 2003. Five genotypes (298T-9, E100Ym, 272-2, CDC Anna and CDC Frontier) were grown in pots under 12 and 18 hours of photoperiod. The single-pot plots were arranged in RCB design with three replications. Pots were moved around at frequent interval to ensure uniform exposure to light. Time (days) taken to 50% flowering was recorded according to Sing *et. al* (1983). Internode length characteristic was also studied on the same experimental set-up.

Further, genotypes selected for early flowering, short internode length and double podding traits were crossed to locally adapted parents. The F_1's are being grown and evaluation will be made on F_2 and subsequent generations. Variability for days to maturity and association of time to flowering, internode length and expressivity of double pods with time to maturity will be determined on F_2 populations. Finally, five top and bottom genotypes for traits of interest will be selected from F_4 population and will be compared for maturity duration in a replicated trial.

Preliminary results

Significant differences occurred between genotypes in time to flowering under 12 and 18 hours of photoperiod (Table 1). Genotype 298T-9, which is a super early flowering line under field condition, flowered 3-5 days earlier that of CDC varieties (CDC Anna and CDC Frontier) under the long day condition. The differences were wider under the short photoperiod, as CDC Anna and CDC Frontier were more sensitive to reduced photoperiod. These varieties are categorized as late flowering type under field conditions, which may explain their sensitivity to photoperiod. Or *et. al* (1999) reported that early flowering is related to photoperiod insensitivity. However, further study is required to determine photoperiodic reaction (sensitive Vs day neutral response) that would lead to early flowering in chickpea in western Canadian environment.

Internode length was found to be variable among genotypes and across stem region on a given plant (Table 2). Dwarf genotype E100Ym had an average internode length of 0.4 cm, which is about five times shorter than that for other genotypes. This increased the rate of node and pod formation. It appears that a short internode length could be exploited as a strategy to reduce growth duration in chickpea without a negative effect on yield and yield components. A study is in progress to determine the functional relationships of internode length, time to flowering and expressivity of double podding with maturity duration in chickpea.

Table 1. Days to 50% flowering of selected chickpea genotypes under two photoperiodic regimes

No	Genotype	Photoperiod	
		12 hour	18 hour
1	CDC Anna	42	28
2	272-2	43	25
3	298T-9	38	25
4	E100Ym	58	42
5	CDC Frontier	51	30
Mean		46	30
LSD (0.05)		2.8	2.9
CV (%)		3.3	5.4

Table 2. Mean internode length (cm) of selected chickpea genotypes across different stem regions of the major primary branch

No	Genotype	Stem region (bottom to top internode number)		
		Bottom (1^{st} and 2^{nd})	Middle (3^{rd} –12^{th})	Top (> 13^{th})
1	CDC Anna	2.1	2.5	1.6
2	272-2	1.7	2.1	1.6
3	298T-9	2.1	1.8	0.7
4	E100Ym	1.2	0.4	0.3
5	CDC Frontier	1.8	2.3	1.6
Mean		1.8	1.9	1.3
LSD (0.05)		0.8	0.2	0.2
CV (%)		24.4	5.9	7.6

References

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